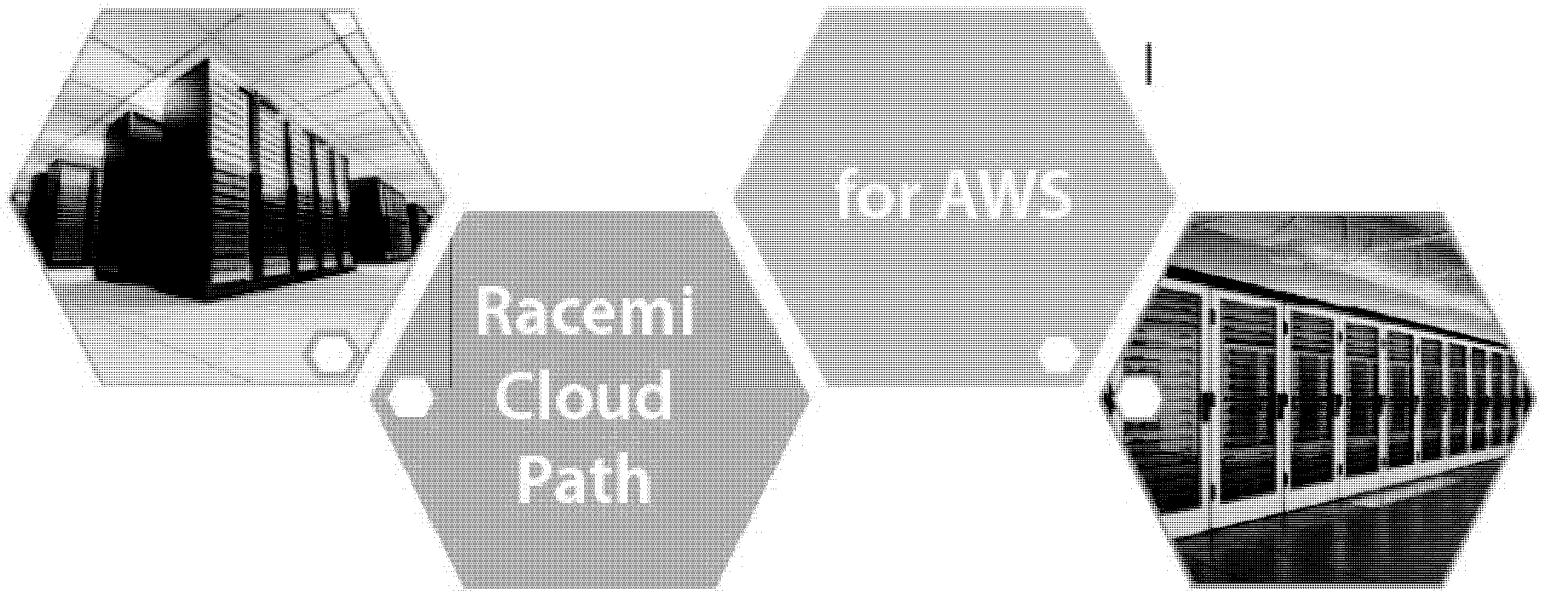
ESTTA Tracking number: **ESTTA646721**

Filing date: **12/23/2014**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

Proceeding	92057344
Party	Plaintiff Cloudpath Networks, Inc.
Correspondence Address	STEPHEN GRUBER NEUGEBOREN O'DOWD PC 1227 SPRUCE STREET, SUITE 200 BOULDER, CO 80302 UNITED STATES craig@neugeborenlaw.com, sarah@nodiplaw.com
Submission	Plaintiff's Notice of Reliance
Filer's Name	Craig Neugeboren
Filer's e-mail	craig@neugeborenlaw.com, sarah@nodiplaw.com, vanessa@nodiplaw.com
Signature	/Craig Neugeboren/
Date	12/23/2014
Attachments	RAC0000255_2.pdf(402608 bytes)



Racemi Whitepaper

November 2013

Racemi
Cloud Migration Simplifed

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Racemi
Cloud Migration Simplifed

Introduction

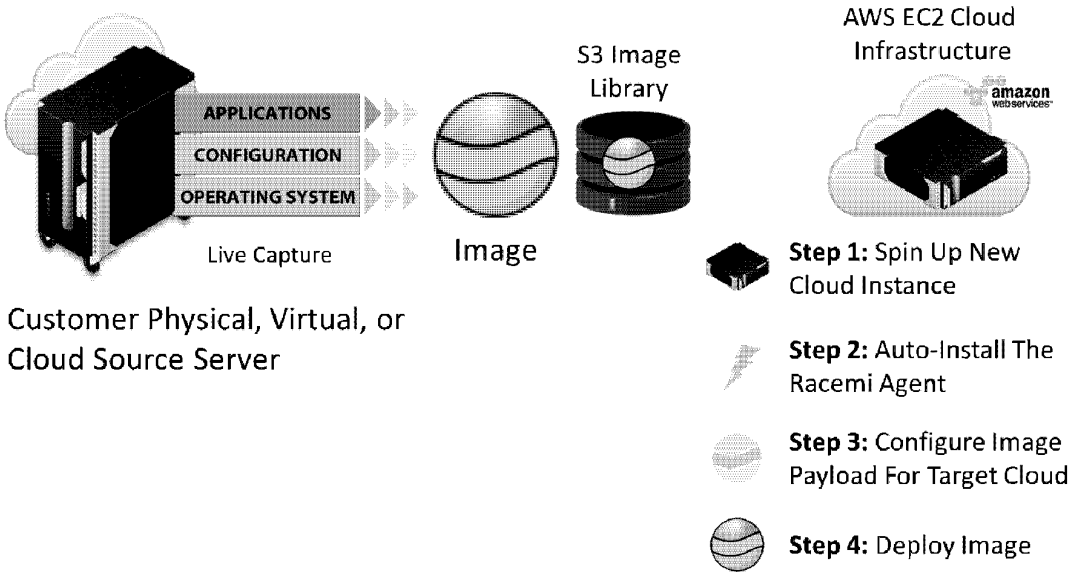
Racemi Cloud Path® for AWS is a Software as a Service hosted on AWS EC2 and S3 that makes automated large scale server migrations to AWS EC2 efficient and cost effective. Since Cloud Path for AWS is true SaaS, there is no infrastructure to buy, manage, or maintain – simply sign up for the service and begin migrating existing physical and virtual servers to EC2 in just a few minutes. This whitepaper covers Cloud Path design and architecture, AWS migration best practices, Cloud Path tips and tricks, and customer case studies on how Racemi saved them time and money during their AWS migration.

Racemi is a pioneer in image based server provisioning and cloud migration solutions. With "industry first" support for migrating application workloads between dissimilar physical, virtual, and cloud infrastructure, Racemi makes it possible for businesses to deploy applications to meet their business needs without fear of vendor lock-in. A Gartner Cool Vendor award winner, Racemi has hundreds of customers, users, and partners leveraging our technology in data centers around the world. The Racemi management team has over 50 years of combined experience with image-based server provisioning technology, products, and solutions. Racemi is based in Atlanta, Georgia USA and is an AWS Technology Partner.

Overview

Racemi Cloud Path for AWS migrates existing servers by capturing an image of the live server, compressing and encrypting the contents as they are streamed over the network, to the customer's S3 storage bucket. After the image capture process is completed, Cloud Path uses native AWS APIs to create a new EC2 server based on the user specified configuration:

- Target Region
- Server Specs (CPU, RAM configuration)
- Server Name
- Security Group
- Availability Zone



Once the new EC2 server has been created, Cloud Path automatically installs our Migration Agent, which extracts the networking and virtual tools from the source AMI (selected based on the source server OS). The source AMI is then destroyed, the required virtual tools are inserted into the customer's captured image, and the file system is laid out on the target EC2 instance using EBS volumes, matching the source system volume configuration as closely as possible. This enables Cloud Path to handle multi-disk servers and other complex configurations not addressed by simple import and export tools and formats.

Here are some of the key features and benefits to AWS customers looking to migrate existing servers to AWS EC2 server instances:

- Easy to use, self-service web interface
- Support for physical, virtual, or even other cloud servers
- Support for Windows and Linux servers
- Support for multi-disk/volume servers
- Live capture support to minimize server down time
- Data compression for efficient data transfer
- 256 bit SSL data encryption
- Firewall friendly outbound HTTPS communications
- Full US and international EC2 Region support
- Double-byte OS support
- Real-time status tracking
- Built in electronic support
- Bulk scheduling support for migrations during "off peak" hours

Supported Platforms

Cloud Path can migrate a wide range of existing servers to EC2, including physical, virtual, and even other cloud servers.

Operating Systems

Racemi Cloud Path supports the following Operating Systems:

- Windows Server 2008 R2
- RedHat Enterprise Linux 5.x and 6.x
- CentOS 5.x and 6.x

Hypervisors

Cloud Path supports virtual machines hosted on the follow hypervisors:

- VMware ESX/ESXi/vSphere
- Citrix Xen
- Open source Xen
- KVM
- Microsoft Hyper-V

Physical Servers

Cloud Path can migrate physical, or "dedicated", servers to EC2 in one automated step. All major manufacturers are supported, including:

- IBM
- HP
- Dell
- Cisco
- Fujitsu

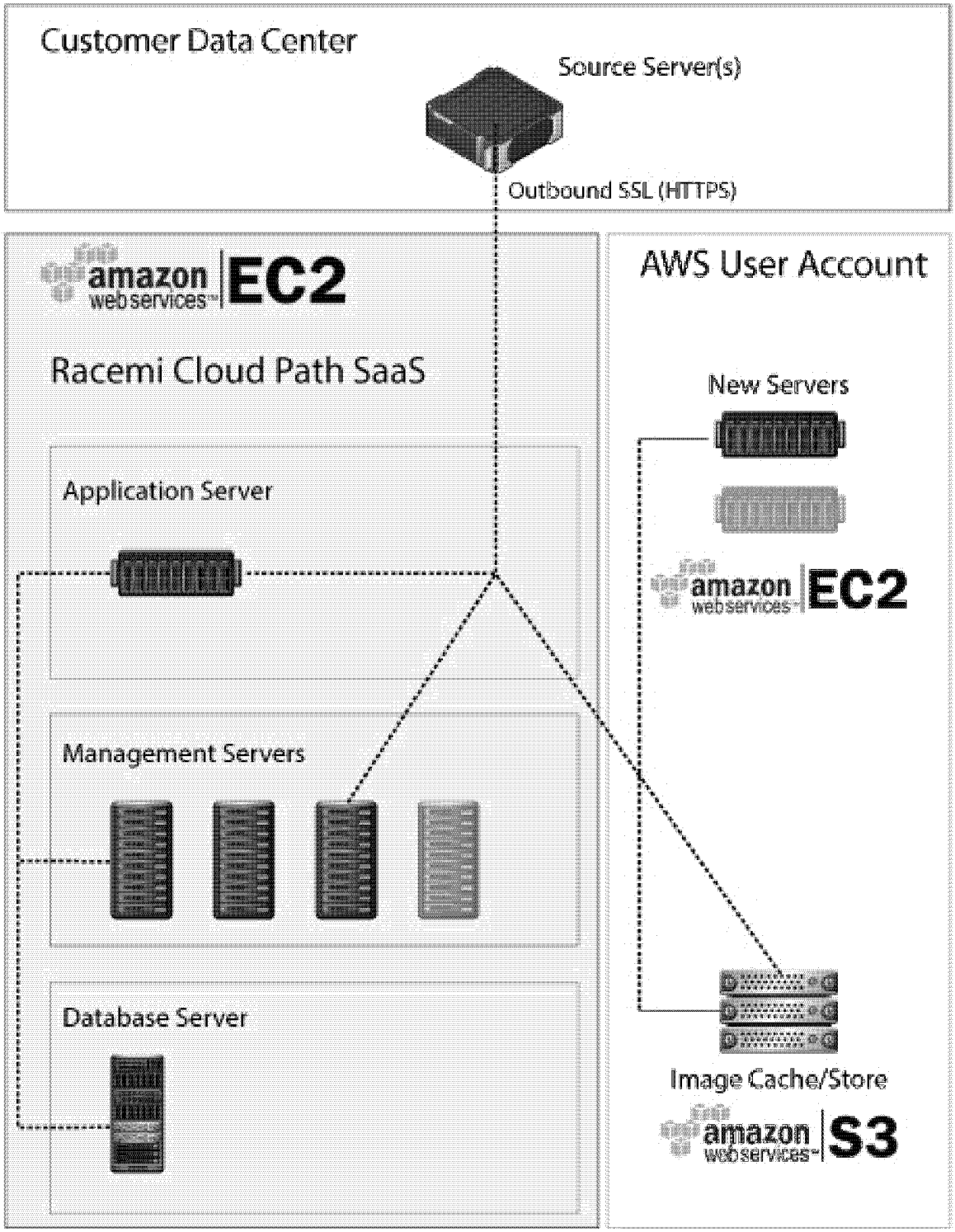
Other Cloud Providers

Racemi has certified the migration of server instances from the following cloud providers:

- Rackspace
- GoGrid
- IBM SmartCloud Enterprise
- SoftLayer CloudLayer
- vCloud providers such as Terremark or Savvis
- OpenStack providers
- CloudStack providers

Architecture

Cloud Path is designed to be highly scalable capable of addressing the most demanding migration needs. The management servers are stateless and load balanced so they can scale horizontally to handle thousands of simultaneous migrations. All communications are encrypted (256 bit SSL AES RSA) and the contents of the source server never reside on Racemi servers, ensuring security and privacy.



Pro Tip:
As Cloud Path is a SaaS application and you wish to migrate servers to a public cloud, your source servers must have internet access over outbound HTTPS (SSL) in order to use this service.

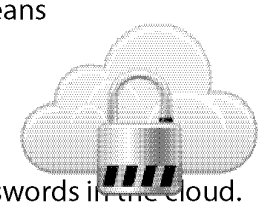
Key Technologies

Cloud Path provides a number of key features that ensure a secure, highly reliable migration experience.

Security

Server contents are automatically encrypted using a 256 bit AES RSA SSL encryption certificate to ensure security of the data in transit. In addition, all Cloud Path console traffic is encrypted using the same method.

Since the Racemi Migration Agent leverages outbound SSL for all communications, there is no need to open inbound holes in customer firewalls. This also means Cloud Path can migrate servers without public IP addresses.



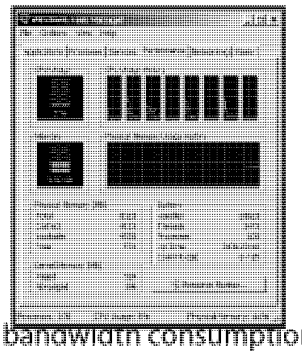
Since Cloud Path is agent-based, there is no need to supply root passwords to the application, which eliminates potential security concerns around transmission and third party storage of root passwords in the cloud.

Privacy

By leveraging the customer's own S3 storage account for image caching/storage, Racemi ensures that customer server data never resides on servers outside of the customer's immediate control. Racemi only stores customer provided account information and server meta data essential for the migration process, such as architecture (32 bit, 64 bit), OS, networking configuration, and disk/volume layout. In addition, Racemi does not document the contents of customer images in any way, outside of the essential meta data listed above.

CPU sensitive Capture Process

The Racemi Migration Agent is CPU sensitive to ensure server performance is not affected during the capture process. If CPU demand spikes during the migration process, the Migration Agent automatically throttles back. Racemi typically recommends that customers schedule migrations for "off peak" hours for best performance.



Compression

During the capture process, the Migration Agent streams the server image over the encrypted network connection to the customer's S3 storage bucket. This data stream is compressed over the wire and stored as a compressed file for maximum efficiency. Since Racemi Cloud Path for AWS pricing is based on bandwidth consumption, customers save money, as they are charged for the compressed image size (1.5 -3x ratio), not the full disk size. This also reduces relevant AWS storage and bandwidth fees for the customer.

Planning Considerations

"Fail to plan, plan to fail" is a good mantra for your cloud migration, especially for moderate to heavily utilized applications. We suggest putting together a documented migration plan detailing each step of your migration project. This will help you more accurately predict time lines and costs associated with your migration project. Here are some key steps in the migration planning process:

1. Discovery of your environment
2. Application review and qualification
3. Environment preparation
4. Staged migration testing
5. Cut-over plan

No matter what your business, the first step in any successful cloud migration plan is to understand what applications you have in your environment, how they are configured, and how moving to AWS will impact the applications. This discovery process is critical to the rest of your cloud migration planning.

Discovery

The goal of this process is to figure out which applications in your environment are candidates to be migrated to the cloud. Depending on the business drivers for your migration, the criteria can vary greatly, ranging from custom in-house developed web apps, to CRM and ERP applications. If your business already has a configuration management tool, it can greatly simplify the process by generating reports for which applications are in your environment, where they are installed, and even correlate performance data to ensure proper sizing of the new virtual server in the cloud.

Application Review and Qualification Criteria

Once your discovery is completed, there are key criteria that you should consider when qualifying applications as candidates for migration to the cloud, including:

- How "complex" is the application?
- What environment components does the application depend on?
- How heavily is the application utilized?
- Do you want to upgrade the OS or application during the migration process?

How Complex Is The Application?

Multi-tier applications require additional consideration when considering a cloud migration. Some key factors to consider are:

- Hybrid approach - if considering a hybrid approach with a database located in your private data center and application servers in the cloud, careful evaluation of performance impacts must be weighed against security concerns. If performance is paramount, and will be measurably impacted by remote network connectivity, you should consider hosting the database in the cloud, if your security policies and compliance requirements allow for it. You could also consider options like AWS Direct Connect to maximize bandwidth between your cloud environment and your data center. Conversely, if security is paramount, and performance is measurably impacted, you may want to disqualify the application as a candidate for migration.
- Networking - how are the systems networked together? Are they on dedicated VLANs currently? Do they communicate over web protocols? What is the implication to your corporate firewall? AWS provides extensive support for networking in VPC and can address a wide range of needs, assuming you have done your due diligence and know

what is needed. To ensure a smooth transition, you should have all firewall, VLAN, and other networking considerations addressed in your migration plan.

How Heavily Is the Application Utilized?

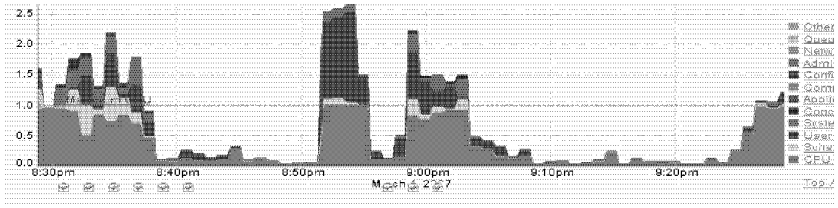
By tracking application utilization for a minimum of 30 days prior to your migration, you can better assess cloud migration candidates and appropriate server sizing for your migration. You can also better determine how IaaS will actually affect costs for your business.

Pro Tip:
A common mistake many businesses make is oversizing the new cloud server. By having performance data for these servers and services, you can more accurately size the new cloud server instances in AWS.

Heavily Utilized Applications

Applications that are heavily utilized by a large number of internal or external customers will require additional consideration.

- As a large number of users could be impacted, schedule the migration to occur during "off peak" hours to ensure minimal impact.
- Heavily utilized applications will need a staged migration, where you perform an initial migration, configure the networking, DNS, and other configuration vari-ables, and then perform a final "cut over" to ensure maximum availability and minimum impact.
- Heavily utilized applications have a higher ROI than moderately used applications as you are getting more value for your IaaS dollar spent.



Lightly Utilized Applications

If you discover lightly utilized applications in your environment, they can also make good candidates for migrating to the cloud. However, it is important to determine how accessible the application needs to be in order to justify the move to AWS. If it is acceptable to provide the application as an "on demand" service you could save significant money by shutting down the server when it is not needed. Otherwise, you are paying hourly for instances that aren't being utilized and it might be more cost effective to consolidate these applications to a single hypervisor in your private data center.

Do You Want To Upgrade Your OS As Part Of The Migration Process?

Your discovery should have uncovered the vendor and version of the OS hosting your application. Cloud Path currently supports Windows, RHEL, and CentOS (see "Supported Operating Systems" for a complete list of versions). If your OS is not supported by Cloud Path, you may need to consider migrating to AWS manually. A manual migration project might also be a good time to upgrade the OS for reasons such as supportability, performance, security, and stability. Here are some key considerations if you decide that upgrading the OS is the right choice for your business:

- Does the current application version support a newer OS or OS variant? If not, how complex is the upgrade process and will it put your project over budget?
- How will you migrate the data? You will need to find an AMI and test it to ensure it meets your configuration/security/compliance/privacy needs. Then once it is installed, you will need to replicate the currently configuration, and then finally, migrate the data. Some apps provide upgrade tools, some data base providers offer data replication, but it is important to understand your options prior to committing to this path.

These are just a few considerations and should be included as part of the larger discovery and evaluation process. By completing a detailed discovery of your environment, you will increase your chances of having a successful cloud migration experience.

Environment Preparation

Once you have finished the discovery process and analyzed your data, you should be able to identify which applications you will be moving and their unique configuration needs. Now you can proceed to plan out the migration process for each specific application in a more accurate and detailed way. Here are some things you will need to consider for each application.

Server Configuration

Cloud Path supports multi-disk servers so it's important to identify if you have NAS or shared SAN storage attached to the server. If so, you will want to unmount any drives/volumes prior to starting the image capture process, or the Migration Agent will capture that data. The agent automatically ignores CD ROM drives.

Security Group Setup

Cloud Path let's you specify a Security Group and Availability Zone as part of the migration process. Ensure you have setup the Security Group in EC2 prior to your migration. If you do not specify a Security Group or Availability Zone, Cloud Path will create a default Security Group in your EC2 account which you can modify later and AWS will automatically select the Availability Zone for your new EC2 server.

Pro Tip:
AWS does NOT allow you to change Security Groups once your instance has been created, however, you CAN change SG rules) .

DNS Updates

Your new EC2 server will have new IP addresses. With DNS caching, it can take up to seven days before DNS changes propagate across the Internet. By changing your DNS record TTL (Time To Live) you can set how long your DNS entries should be cached. For best results, set this value up to a week in advance is recommended It's also advised to change or remove any SPF records if you have any.

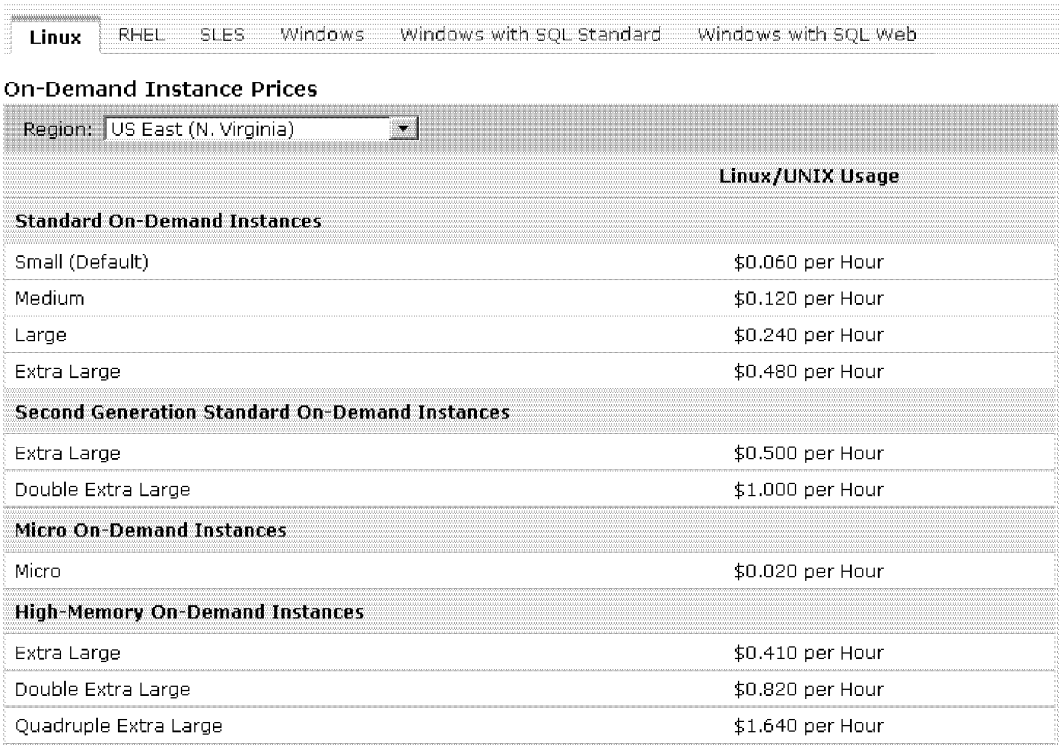
Pro Tip:
Remember that you can always INCREASE the specs on your server once it is migrated into EC2.

Maintenance Window

You will want to schedule a maintenance window for off peak hours to ensure maximum performance and minimal service disruption. The window length should be based on the results of your verification testing Cloud Path allows you to schedule migrations to support that maintenance window. Cloud Path takes a live snapshot of the server, so there is no server downtime required for the migration process. Depending on the utilization of the application, you may want to send out email notification of the maintenance window.

Server Sizing

A common mistake made during a cloud migration is oversizing the target server. If you incorporated utilization and performance metrics in your discovery process, you should have a good idea of what CPU and RAM requirements will work best. Review the EC2 server sizes and find the best match for your needs.



Linux | RHEL | SLES | Windows | Windows with SQL Standard | Windows with SQL Web

On-Demand Instance Prices

Region: US East (N. Virginia)

	Linux/UNIX Usage
Standard On-Demand Instances	
Small (Default)	$0.060 per Hour
Medium	$0.120 per Hour
Large	$0.240 per Hour
Extra Large	$0.480 per Hour
Second Generation Standard On-Demand Instances	
Extra Large	$0.500 per Hour
Double Extra Large	$1.000 per Hour
Micro On-Demand Instances	
Micro	$0.020 per Hour
High-Memory On-Demand Instances	
Extra Large	$0.410 per Hour
Double Extra Large	$0.820 per Hour
Quadruple Extra Large	$1.640 per Hour

Staged Migration Testing

For best results, we suggest performing a test migration for verification testing. This will help you:

1. Better understand how long it will actually take to migrate your server, so you can set aside a conservative maintenance window to complete the move.
2. Help identify any issues and give you a chance to correct them prior to cut over in order to minimize potential service disruption.

This entails working through your migration plan up until you reach the cut over stage, including verification testing. Once Cloud Path has completed the migration of your workload, you can begin verification testing of your application at its new IP address. Since the new server is a clone of your existing server in it's time tested and proven configuration, you should be able to complete testing much more quickly than if you were building the server from scratch and migrating the data. Your test migration evaluation should include:

- Networking between application components.
- Software licensing - since we have moved the application to a new server, you may need to re-activate software licenses that detect this change.
- IT management applications may require firewall or configuration updates to contact their management server.

Performing staged verification testing will help determine any migration complexities that may have not been accounted for during planning and ensure a successful migration.

The Cut-over

Once you have finished your staged migration testing, you can have the confidence to move forward with the formal migration. Work through your refined migration plan and once Cloud Path has finished migrating your server workload, you will likely need to complete several tasks. Follow the cut over procedures you have identified for the application. Here are some common cut over steps:

- Change your DNS records to resolve to the new IP address.
- Redirect traffic from the old server to the new EC2 server.

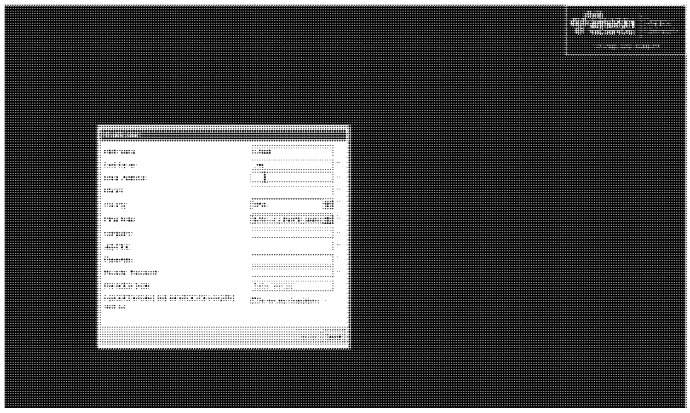
Once these steps have been completed, all new traffic receiving the current DNS information will be sent to the new EC2 server. All traffic that has old DNS information will be sent to the old server and redirected to the new server. This allows for all traffic to be delivered to the new server regardless of what may be cached in DNS. At this point, you can change the TTL values back to default and restore any SPF records after a few days, once it is clear that the Internet recognizes the new IP address. You can then take the old server off line once you feel comfortable that DNS replication is complete.

Using Cloud Path To Migrate A Server

Cloud Path makes it easy to migrate your servers to AWS in just a few easy steps. This document contains a summary of the process, but a complete click through tutorial is available here along with a video demo of the process here.

Register For An Account

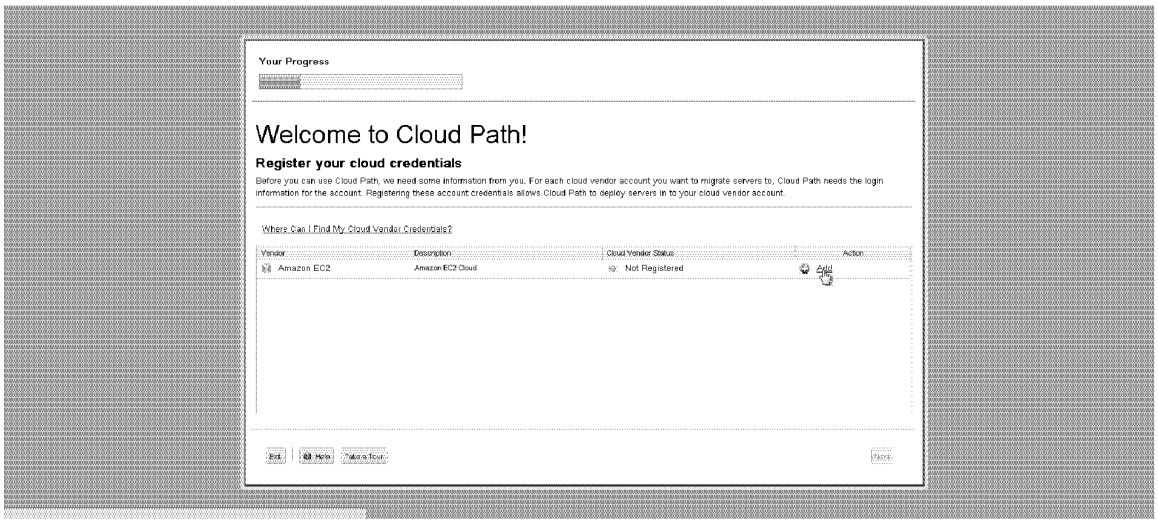
It's very easy to sign up for an account, just head to **http://cloudpath4aws.racemi.com** click the Sign Up button and enter your information. You will receive a verification email at the address you specified on the sign up screen. Click the verification link, and login to the Cloud Path SaaS console.



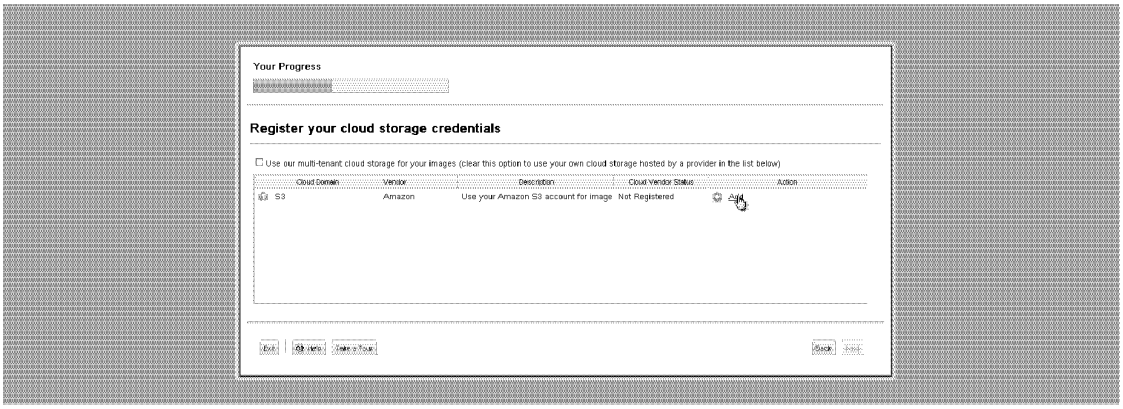
The Getting Started Wizard

Once logged in, you will be taken through a series of screens where you must supply Cloud Path with the key information that is needed for the migration process.

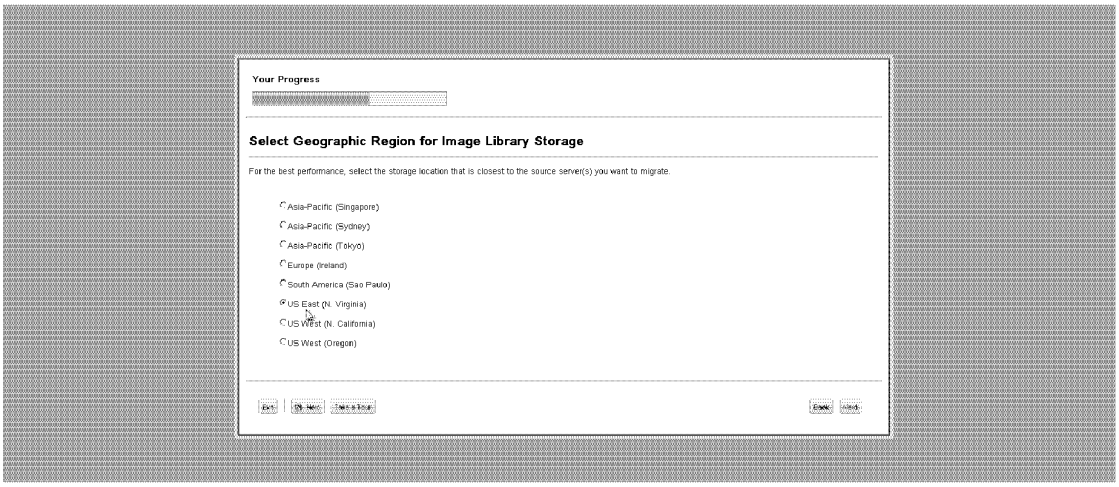
1. Cloud Path needs your AWS API key and Secret Key in order to provision the new EC2 servers into your account. Simply copy & paste them from the AWS console into the Cloud Path wizard.



2. You need to select your storage options. Most users will prefer to use their own AWS account credentials rather than setup Racemi storage. The resulting S3 bucket will be used for temporary storage of your images during the migration process. Images can also be saved for longer periods of time and all images are subject to AWS and Racemi storage fees. Follow the directions on screen to use the credentials you supplied in the previous step to automatically setup a bucket in your S3 account.



3. You will need to select the S3 region you wish to use as your default for image captures. You should select the region that is closest to the servers you wish to migrate. This is your default region, but you can capture images to other S3 regions in the future by going to the Settings/Account page and changing the value in the Image Library Region section to the appropriate region.

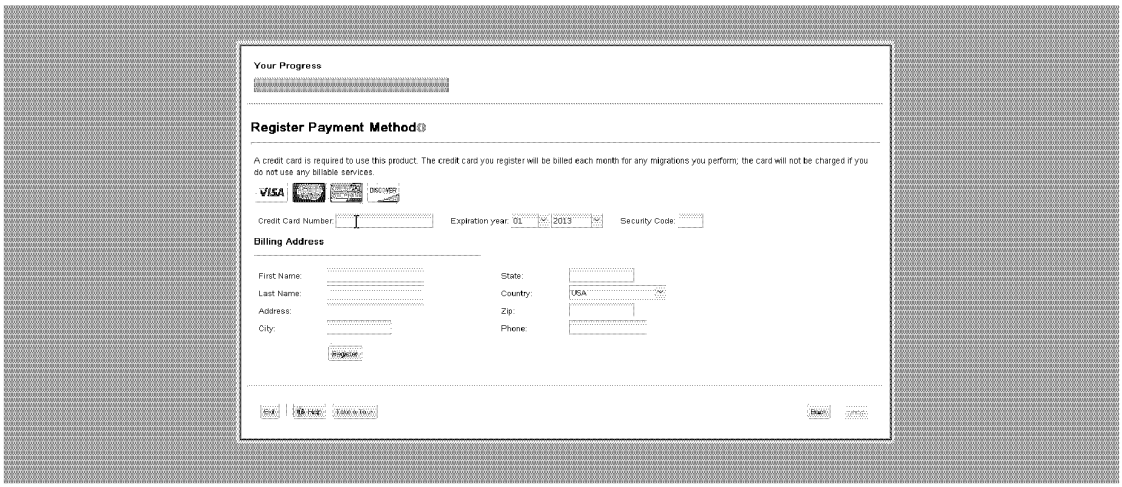


Pro Tip:
You can login to the server you wish to migrate, open a browser and login to Cloud Path, and then download the agent directly to the source server you wish to migrate.

4. You will need to download the Migration Agent and install it on your servers. The server must have internet connectivity to contact the Cloud Path SaaS service and transfer the captured file system contents to AWS. Communication between the agent and Cloud Path occurs over outbound HTTPS (SSL), so make sure this traffic is allowed from your server. For detailed installation instructions, see the Cloud Path online documentation here.

5. You will need to register a credit card with Cloud Path. You will be billed for bandwidth consumed during the image deployment process (S3 to EC2) as well as storage consumption. Remember that images are compressed so your charges will typically be based on only 50-75% of your actual used disk space for a given source server. Compression ratio varies based on the contents of the server. Our Pay As You go billing plan charges $1.99 per GB transfered and $.35 per GB/month for storage while our Subscription plan is available for just $.99 per GB with a minimum monthly commitment of $99. Pay As You Go is the default for new registrations so If you wish to sign up for the Subscription billing plan, simply contact us at sales@racemi.com prior to migrating any servers and we will set up your subscription account.

Your credit card will be charged monthly for any activity during that billing period. You may access your current activity and billing history at any time under the Billing/Account Statement menu. And remember, customers are only billed for successful migrations so there is absolutely no risk to using Cloud Path.



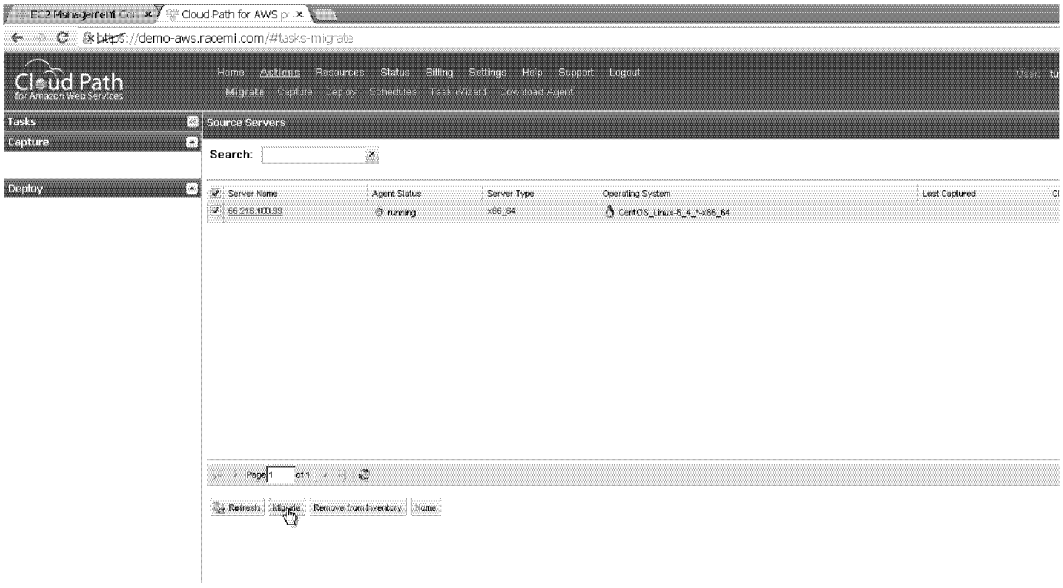
Pro Tip:
If your server does not appear after a few minutes, simply restart the Migration Agent service to trigger the server registration process again. Detailed directions are **available here.**

The Migration Wizard

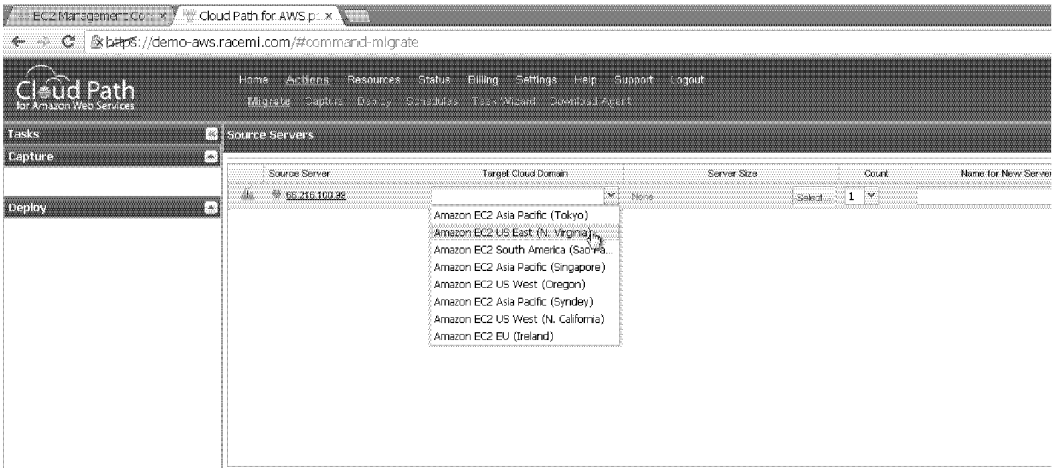
Once you have completed the Getting Started Wizard and installed the Migration Agent on any servers you wish to migrate, click on the Actions/Migrate menu to pull up a list of available source servers.

Cloud Path captures server meta data such as OS, architecture, file system, networking, and other configuration data critical for the migration process. You can access this data by clicking on the IP address of the server listed in the Server Name field. You can also add meta data that can be useful for larger migration projects such as Location and Project Name.

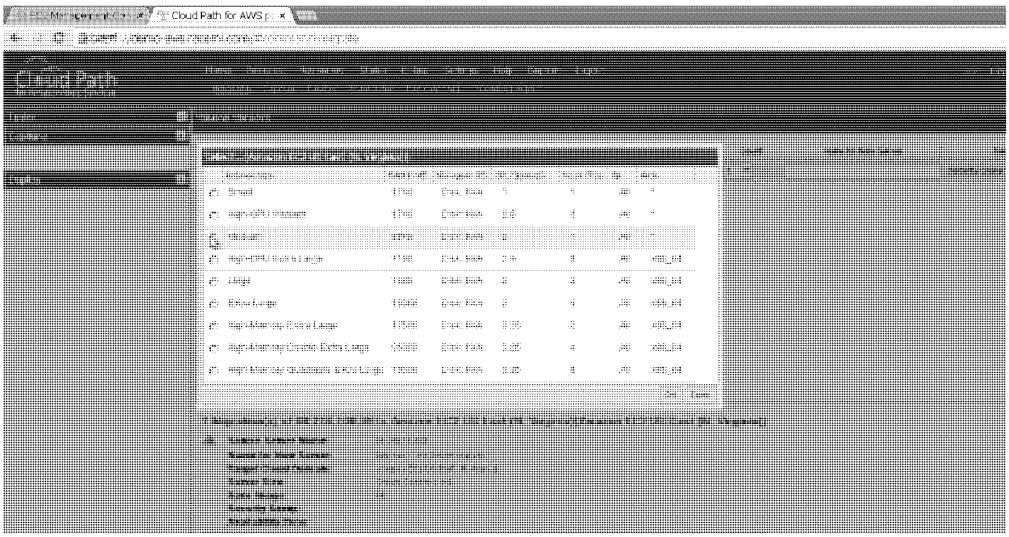
Migrating a server requires just a few steps.
1. Check the box next to the server(s) you wish to migrate and click on the Migrate button at the bottom of the page. This will launch the Migration Wizard.



2. In the Migration Wizard select the target AWS region that you wish to migrate your server to. For best performance, we recommend that your Image Library location be the same as the target region you are about to specify.



3. Once the target region has been selected, you can choose from a list of available hardware sizes. Racemi Cloud Path gets this list from the AWS APIs.



Pro Tip:
Once you set the Security Group for a server, you cannot change it. However, you can change the rules for the Security Group to open up any ports you need.

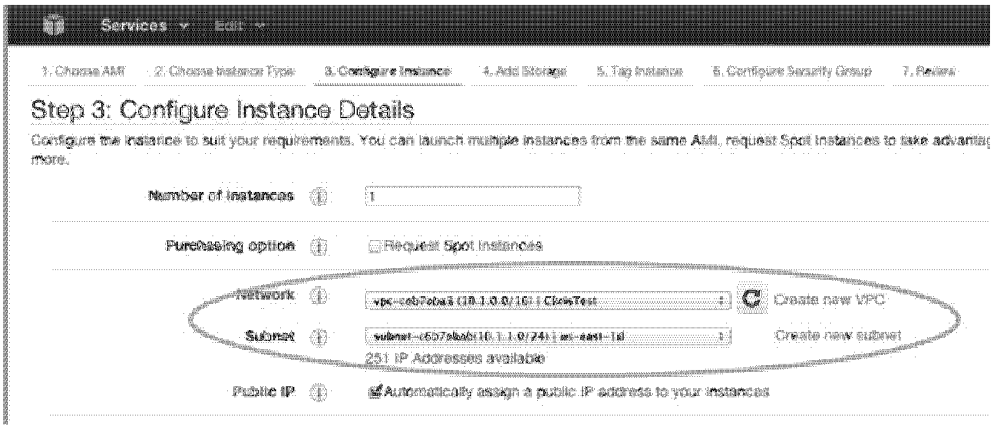
4. Now you must give the server a name and then enter the Security Group you wish to assign the server to. If you do not specify a Security Group, Cloud Path will create a Security Group and add the server to it.
5. By clicking on the Optional Cloud Settings, you can also specify a specific Availability Zone for your server in the Region you selected. The default option is to have AWS specify an AZ automatically.

Since Cloud Path performs a live capture of your server, we recommend scheduling the migration for off peak hours for your location. This will ensure best performance and minimal server impact. Once you have set the schedule, simply click the Migrate button and verify the resulting confirmation dialog.

That's it! Racemi tracks the migration process in real time and automatically inserts the appropriate AWS virtual tools, lays out the file system as EBS volumes, and updates the OS with the AWS networking configuration.

Migrating A Server In To VPC

Once your server is migrated into EC2, it is very easy to migrate it into a VPC network. Simply take a snapshot template of your newly migrated server and then spin up a new VPC instance from the template. It's that easy.

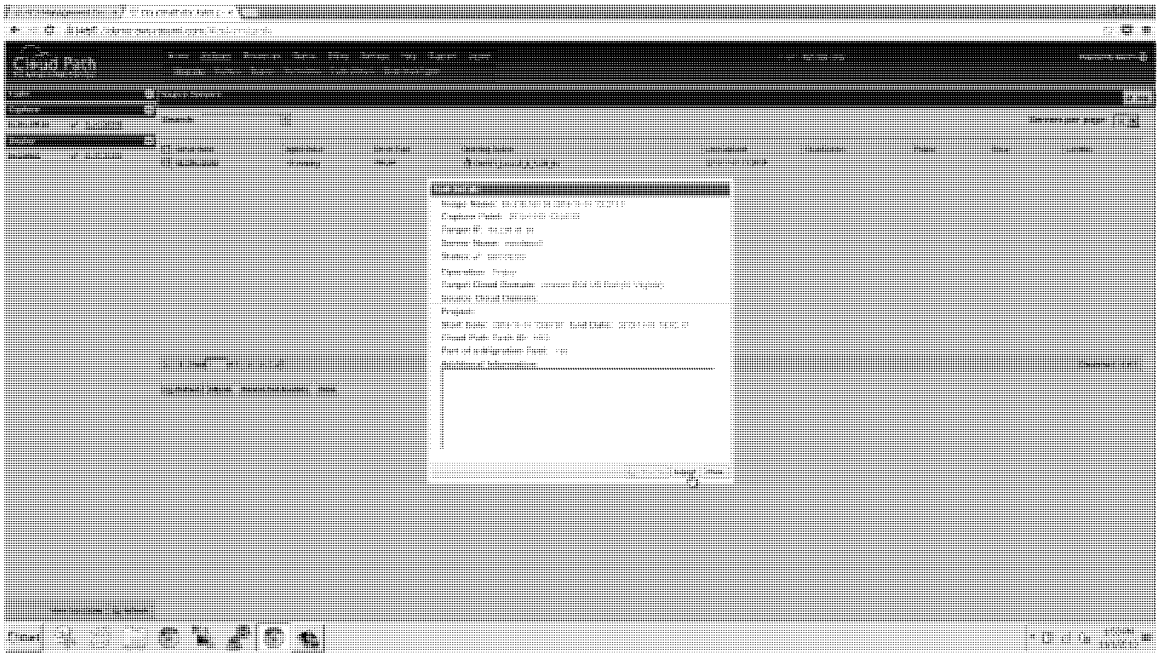


Server Verification

After the migration is completed, you will need to execute your post migration test plan and verify that the server was successfully migrated. Login to the server and verify that the application is functioning correctly and that any data was successfully migrated. Then you can follow the steps outlined in your migration plan for the application cut over.

Getting Support

If you experience an issue with the migration process, you can get help at any time by creating a ticket using Cloud Path's built-in electronic support system. Simply click on the relevant migration task in the Task Status panel and hit the Support button. We will automatically capture relevant logs and meta data from the task as part of your ticket. You will be notified of updates to your ticket by email.



Services Available

If you need help with any stage of your AWS migration project, Racemi can help. We offer Services packages that range from Assisted Migrations that only handle the actual move of your server workloads, to complete assessment and cloud migration planning. For more information, contact us at services@racemi.com

Advantages Compared To The AWS Import Tool

Amazon offers free vm import tools so why should you consider using a paid tool like Racemi Cloud Path? In general, using Racemi Cloud Path will save you more time and money compared to free tools like the AWS Import Tool. In fact our AWS Consulting Partners such as FivePoint and 2nd Watch report an average labor savings of 40 hours per application over the AWS Import Tools. For more information, see our AWS case study at http://www.racemi.com/aws

Here are some specific reasons for considering Racemi Cloud Path for your AWS migration project:

- Cloud Path supports both Windows and Linux platforms
- Cloud Path supports multi-disk/volume servers that are part of a typical enterprise server deployment
- Cloud Path can migrate physical servers in one automated step - no need to virtualize the server first.
- Cloud Path automates the entire process for you - no more extensive vm prep or post import re-configuration
- User friendly GUI interface makes it fast and easy to migrate multiple servers
- Near infinite scale - easily migrate large numbers of servers
- Cloud Path offers greater migration success rates

Summary

Through proactive discovery and planning, you can ensure a successful migration to AWS, and Racemi Cloud Path can help. Cloud Path offers the easiest, most reliable AWS migration solution for your server migration needs. With a wide range of supported physical, virtual, and cloud platforms, migrating your server workload to AWS is simple, no matter it's current platform. And with our zero risk pricing, there are no upfront fees and you only pay for successful migrations. To learn more about Racemi's Cloud Path for AWS, go to http://www.racemi.com/aws